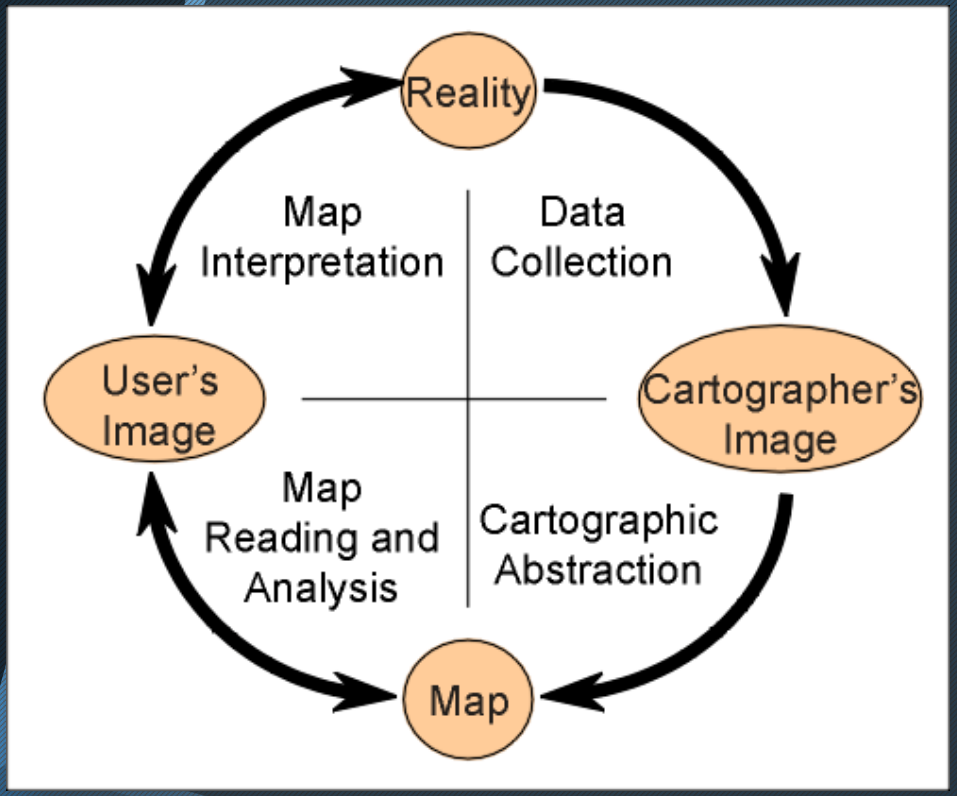
Map Design

"The 'art' of cartography…is not simply an anachronism surviving from some prescientific era; it is an integral part of the cartographic process."

- John Keates

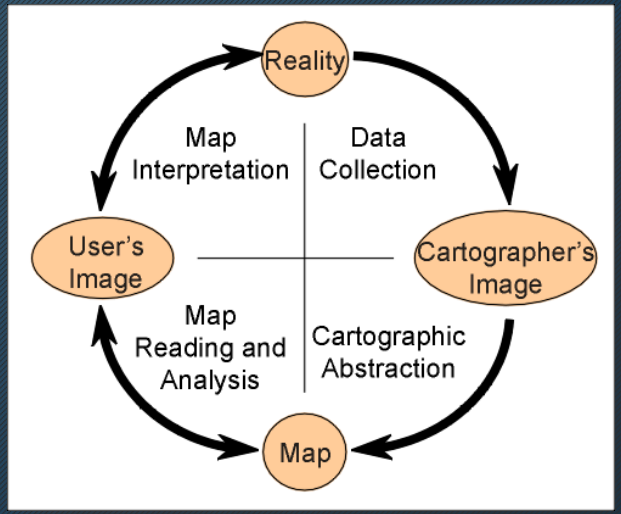
Map Design

"Poorly designed maps are not just hard on the eyes, they can actually convey misinformation and result in poor decision making.



Map Design Process

- Determine the objectives of the map.
- Decide on the data layers to be included.
- Plan a layout.
- Choose colors and symbols.
- Create the map.



Questions to consider

- Who will be using the map?
- Under what circumstances will the map be used?
-
- Is the map likely to be copied or faxed?
- What objectives should the map achieve?
- How sensitive is the map information?

Map Pieces

- Putting together the big picture: arranging and rearranging the map and its associated pieces:
  - Title
  - Scale
  - Explanatory text
  - Legend
  - Directional indicator
  - Border
  - Sources & Credits
  - Inset Maps
  - Locator Maps

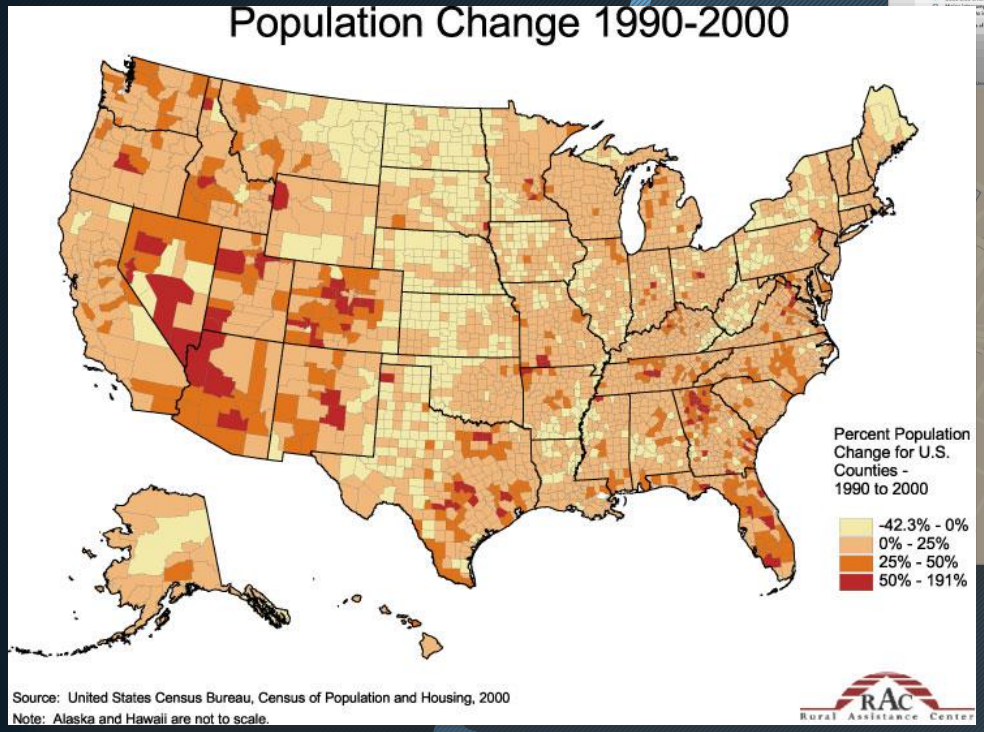
Map Pieces

“ Title:

What: map topic

Where: geographic area

When: temporal info



KEEP IT CONCISE!!

Ex. Ethnic Groups in Columbus OH 1900 – 1960

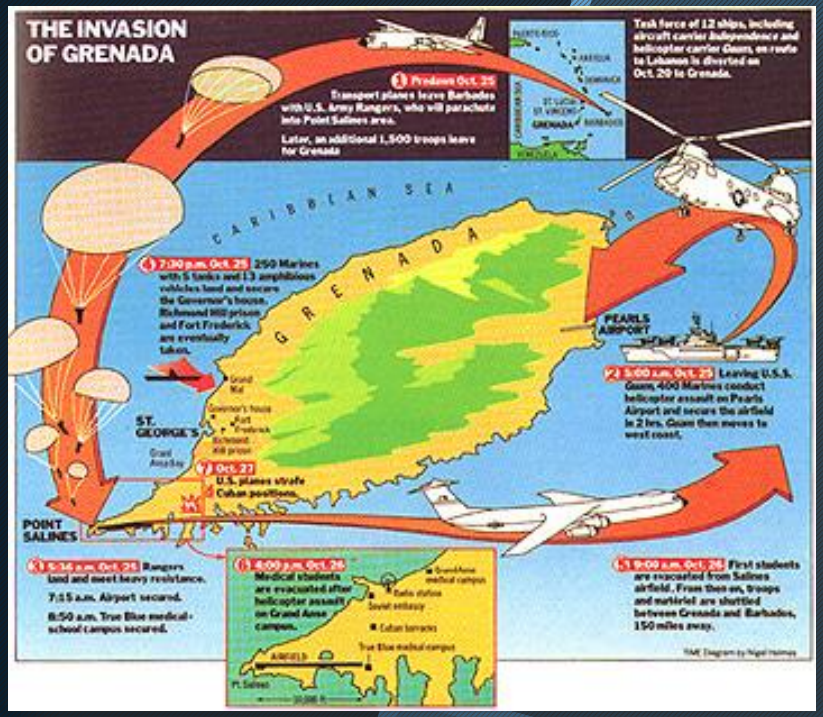
Map Pieces

- Scale:
  - Verbal and visual scales are more intuitive
  - Numerical scales are more flexible
  - Small scale maps (entire earth or a large portion of it) should not include a simple visual scale, because such maps always contain substantial scale variations.

If your map's users might reduce or increase the size of the map a visual scale is best.

Map Pieces

“ Explanatory Text:

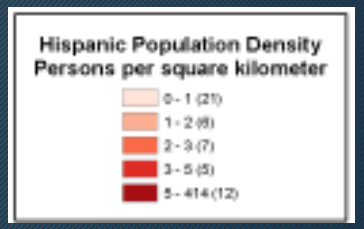


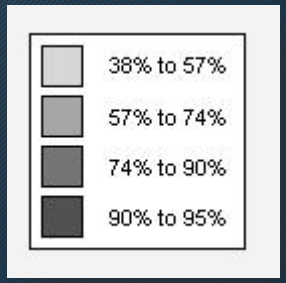
Map Pieces

Legend: the key to understanding symbols on the map

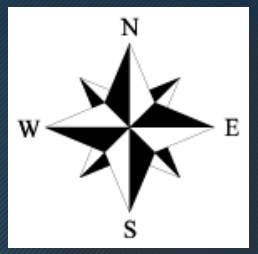
- include any map symbols that are not self-evident

You don't have to put 'key' or 'legend' @ the top!!!

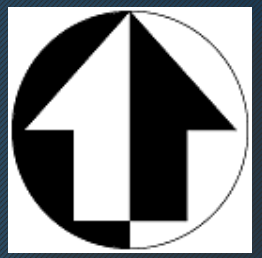




Map Pieces



<u>When to use a North Arrow</u>:



Unusual orientations

(ex. East is up)

When direction is not obvious

(for more detailed, large scale maps)

When direction is important

(ex. Map of prevailing winds)

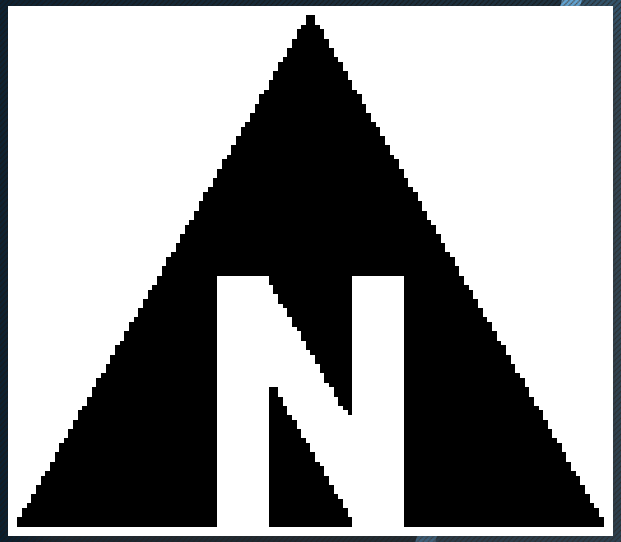
When the map is of an area unfamiliar to your intended audience

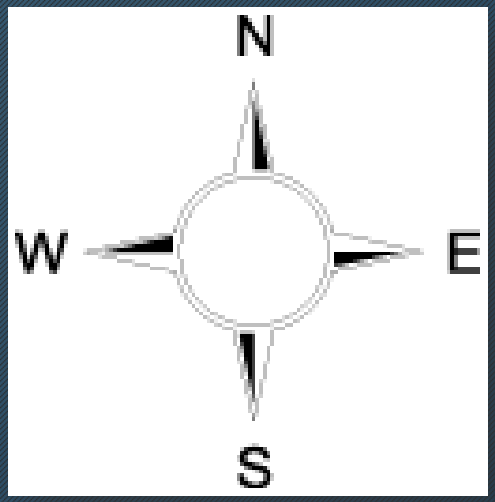
Map Pieces

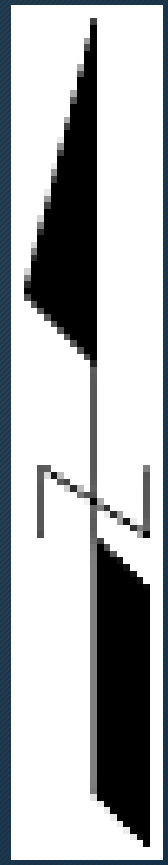
When to use a North Arrow:

DO **NOT** USE A HUMONGOUS NORTH ARROW RELATIVE TO YOUR MAP.

IT JUST LOOKS BAD…



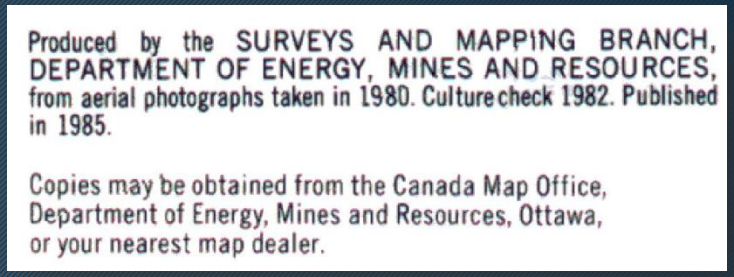




http://gislounge.com/to-north-arrow-or-not-to-north-arrow/
http://blogs.esri.com/Support/blogs/mappingcenter/archive/2007/06/08/does-every-map-need-a-north-arrow-and-scale-bar.aspx

Map Pieces

Sources, Credits, etc.:


Produced by the SURVEYS AND MAPPING BRANCH, DEPARTMENT OF ENERGY, MINES AND RESOURCES, from aerial photographs taken in 1980. Culture check 1982. Published in 1985.

Copies may be obtained from the Canada Map Office, Department of Energy, Mines and Resources, Ottawa, or your nearest map dealer.

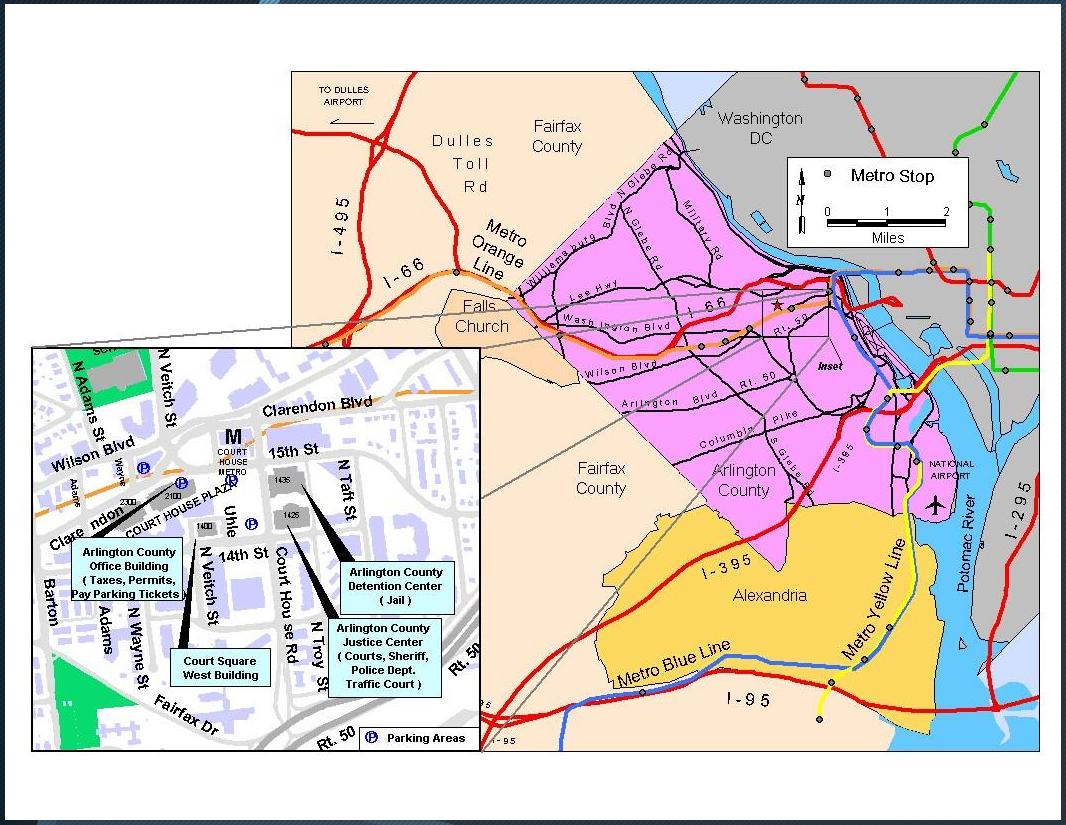
Might include:

- Data sources & citations
- Map maker and date (that's you!)
- Organization & logos
- Disclaimers and legal information
- Map series information
- Copyright and use issues
- Map projection & coordinate system

Map Pieces

Inset & Locator Maps:

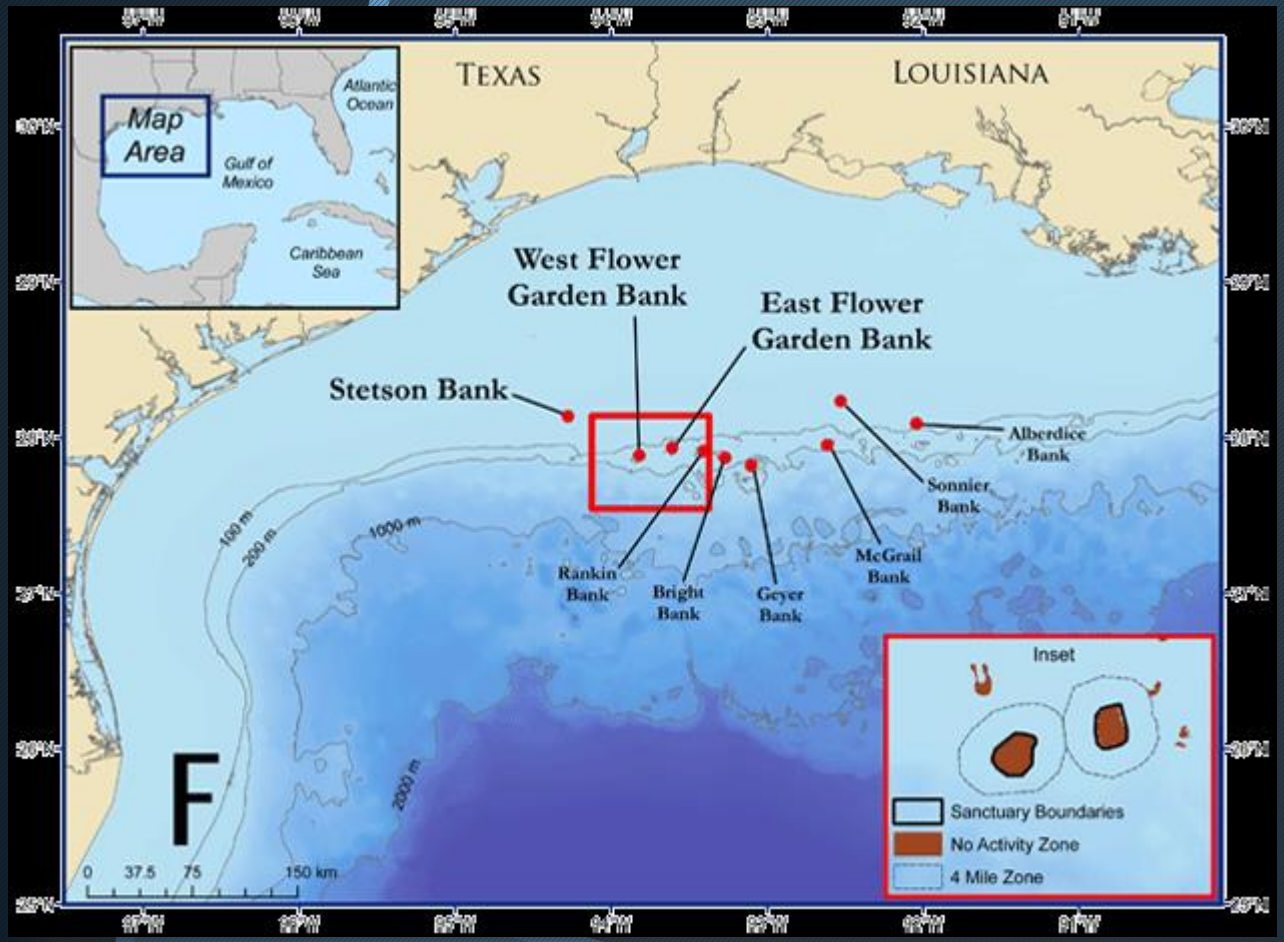
Can provide a larger scale view to understand areas that are difficult to see at the scale of the main map



Map Pieces

Inset & Locator Maps:

Can provide a smaller scale view that provides the context of the area on the main map.



What's our purpose again?

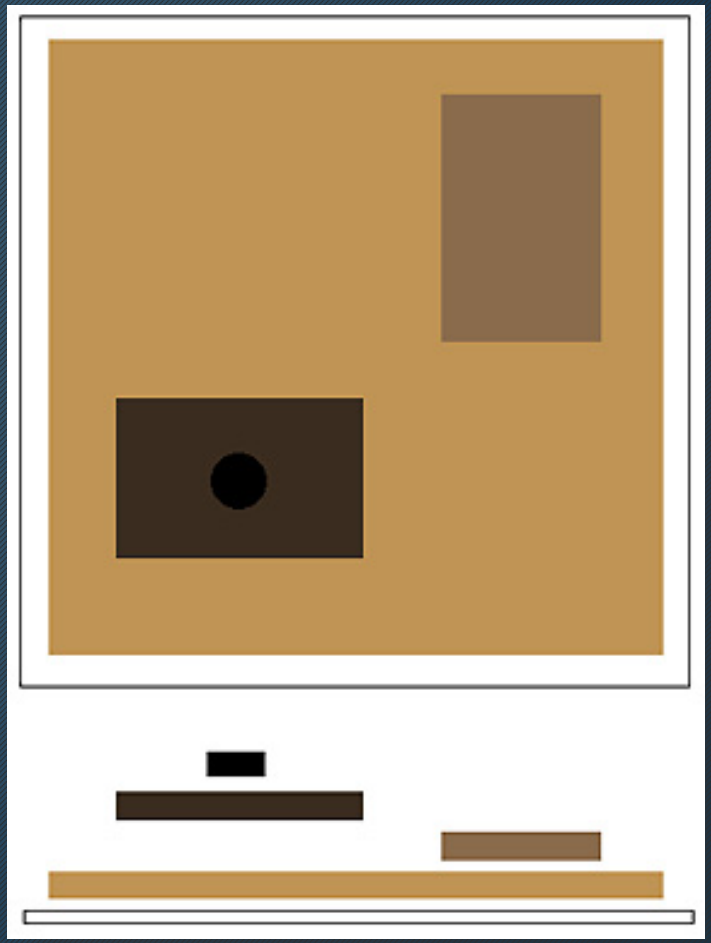
- Map purpose drives:
  - The selection of base map data (scale, detail, projection)
  - The selection of thematic data

- It also drives the DESIGN of the map:
  - Suggests an intellectual hierarchy for the map
    - Which determines the map's visual hierarchy

Visual Hierarchy

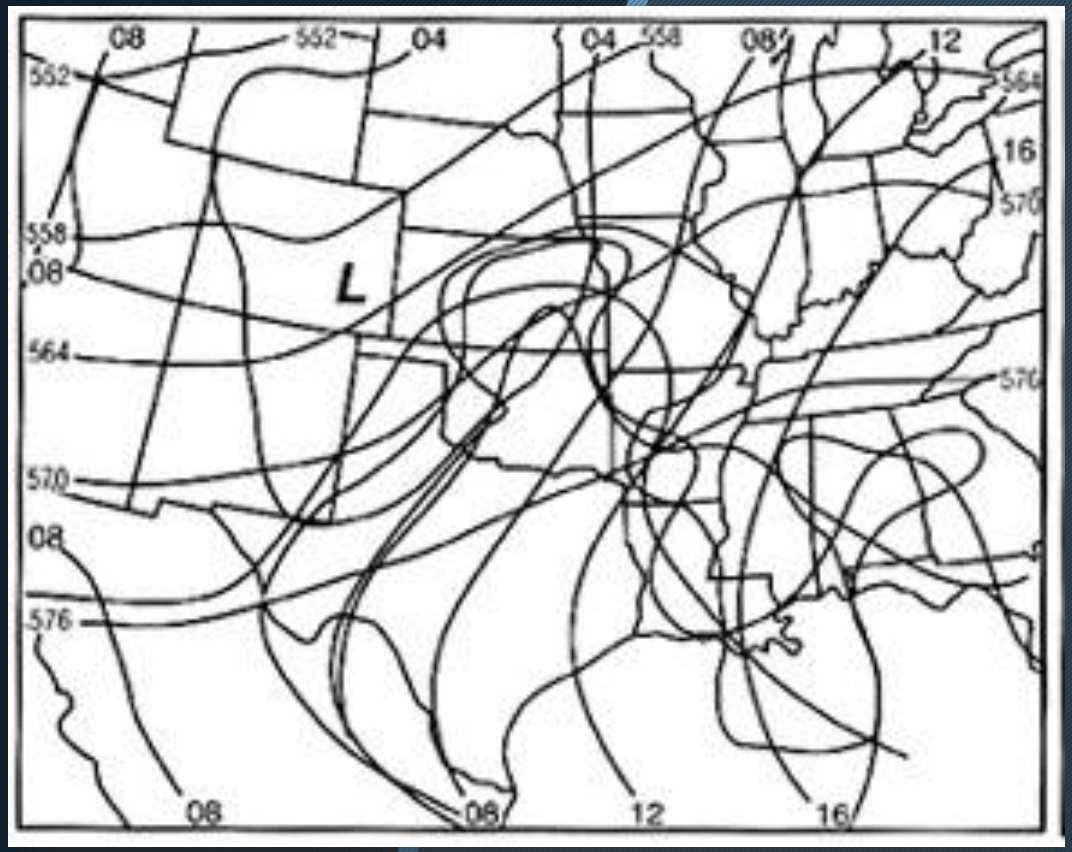
- Choose a visual hierarchy that represents the intellectual hierarchy

- Visual hierarchy adds ‘depth’ to a flat paper or on-screen map



Visual Hierarchy

Failed visual hierarchy limits the map's ability to effectively communicate.



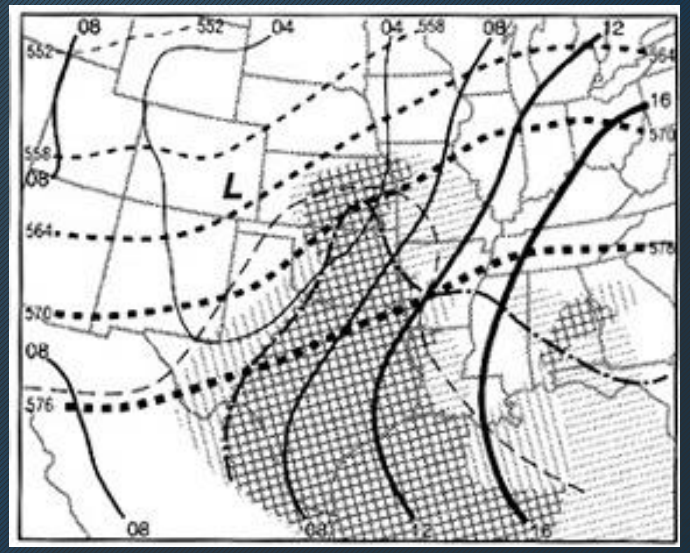
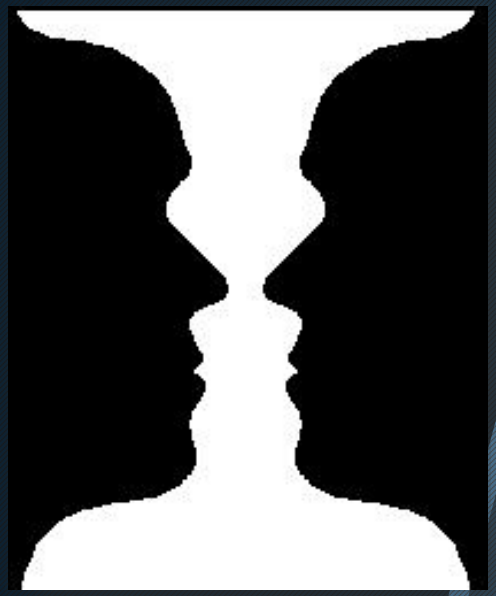


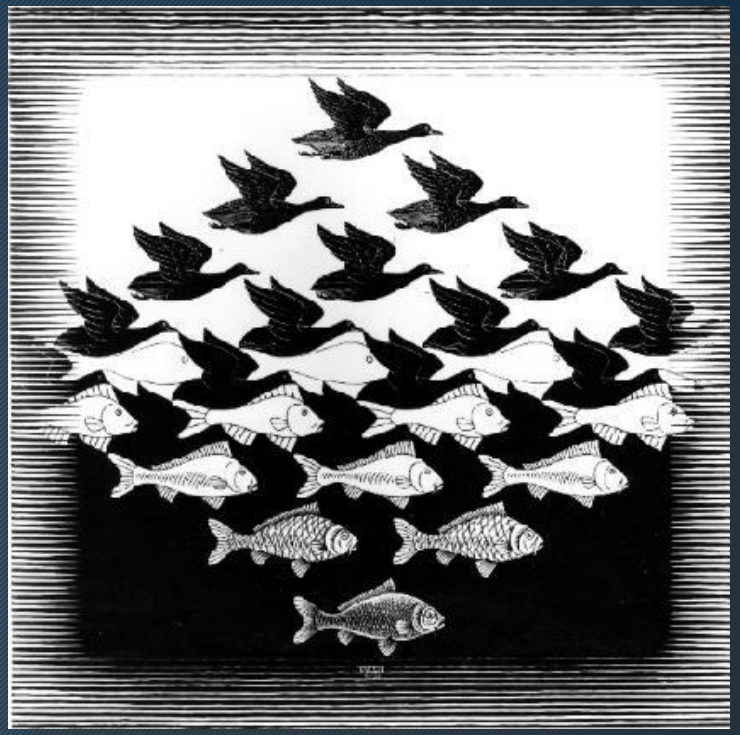
Figure - Ground

- Figure - ground phenomena
  - We see objects having form as segregated from their surroundings which are formless
  - Objects that stand out against their backgrounds are called **figures** in perception, and their formless backgrounds are **grounds**

Figure - Ground

- Gestalt Principles
  - Reversible figure-ground diagrams





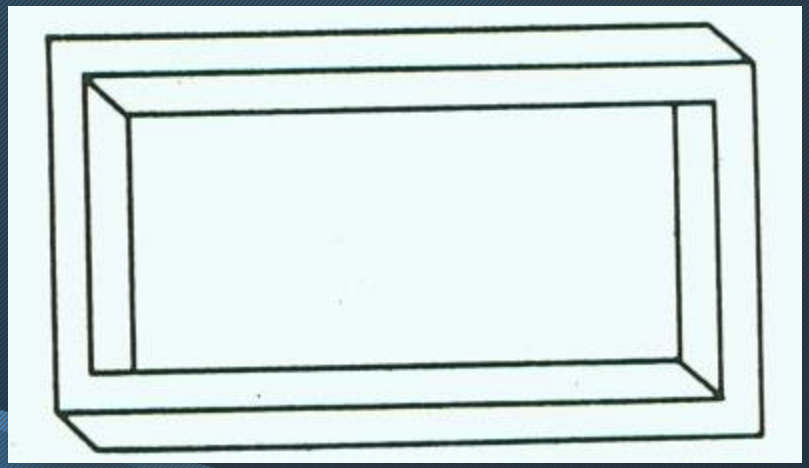
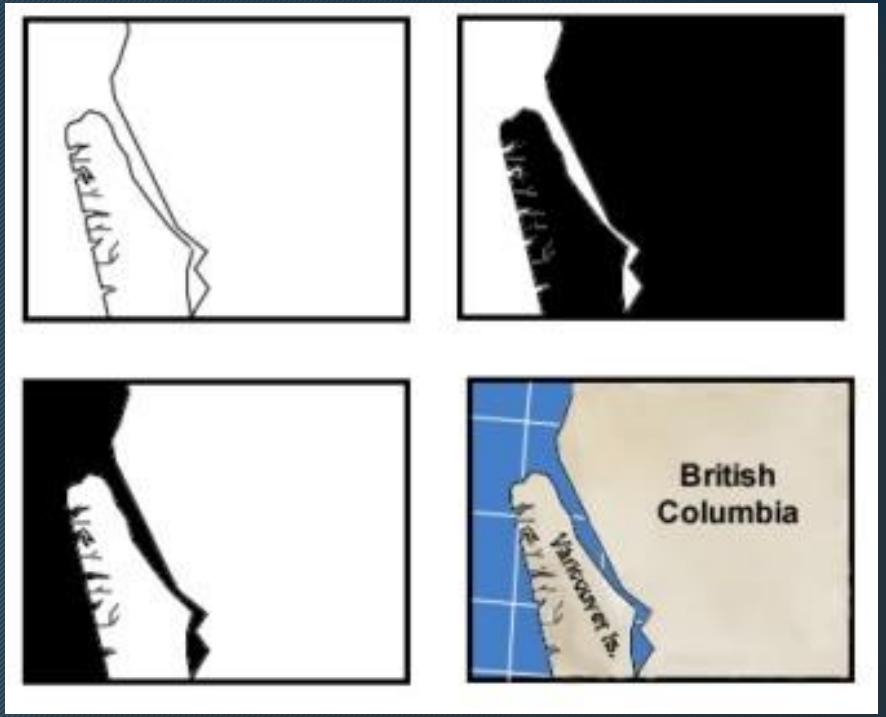
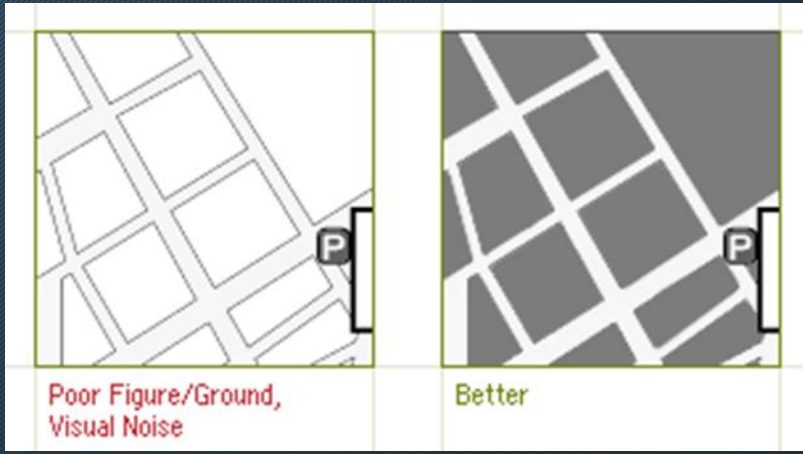


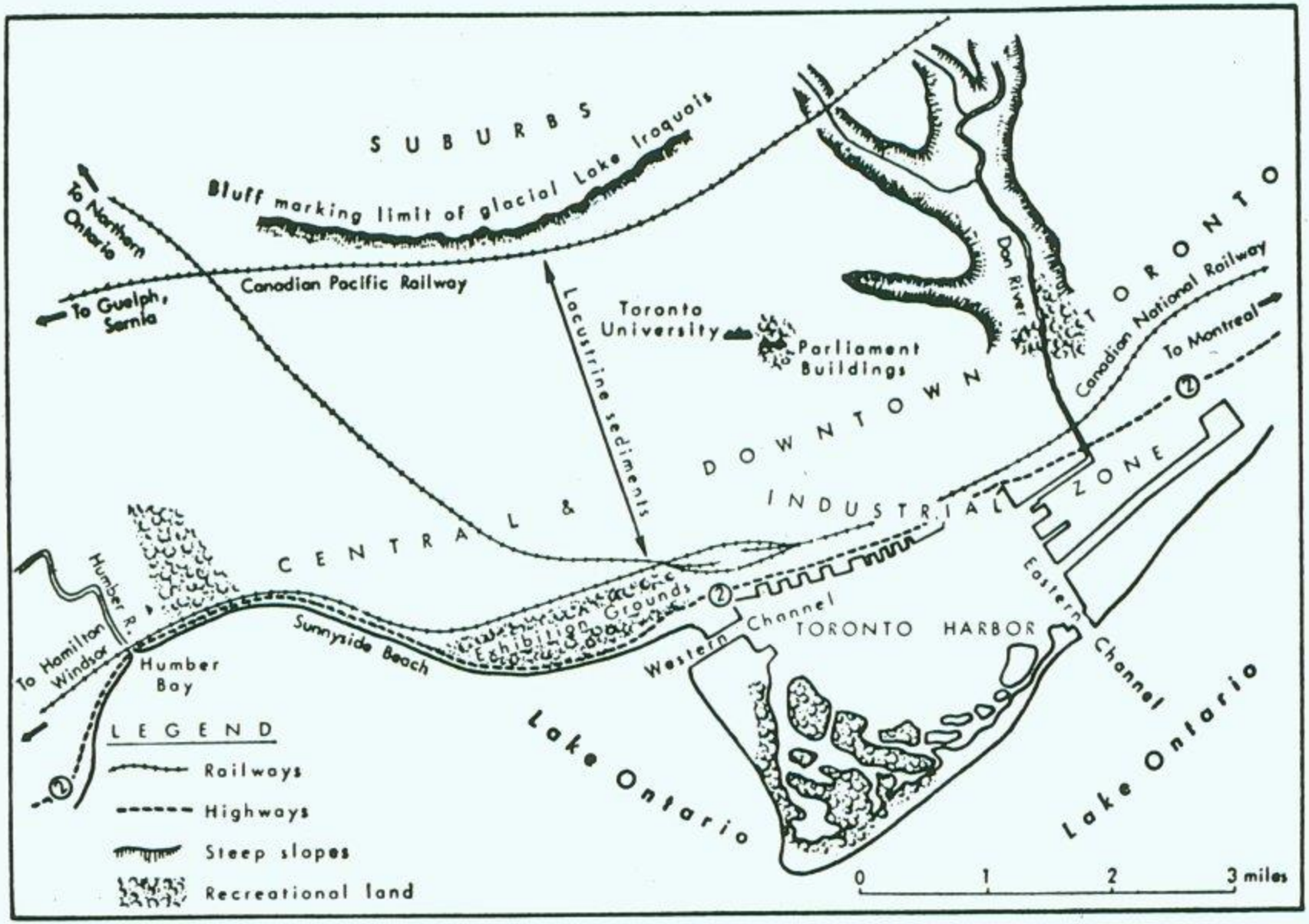
Figure - Ground

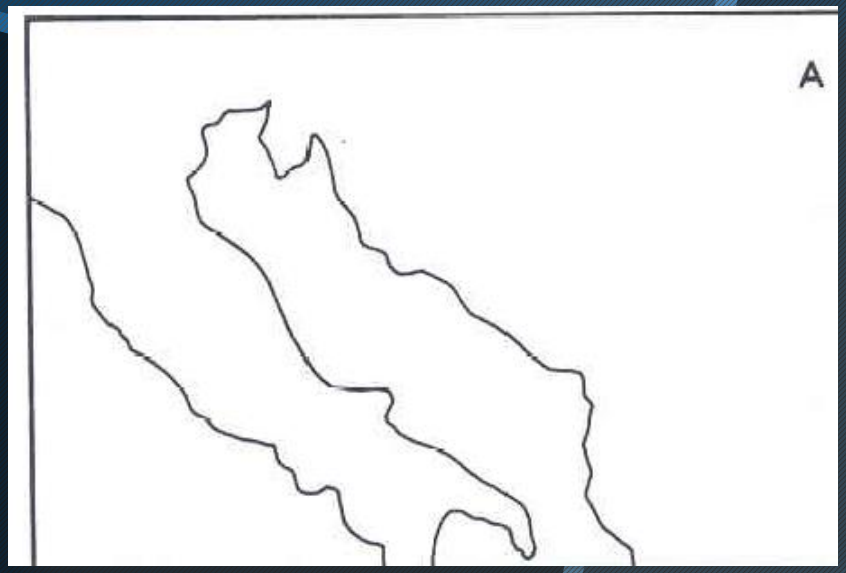
- Figure on Maps:
  - **Most important map elements**
  - **More important meaning**
  - **Distinct form and shape**
  - **Jumps Out**



- Ground on Maps
  - Least important map elements
  - Less important meaning
  - Indistinct form and shape
  - Falls back




SUBURBS
Bluff marking limit of glacial Lake Iroquois
To Northern Ontario
To Guelph, Sarnia
Canadian Pacific Railway
Toronto University
Parliament Buildings
Locustrine sediments
Don River
TORONTO
Canadian National Railway
To Montreal
DOWNTOWN
INDUSTRIAL ZONE
CENTRAL &
Humber R.
To Hamilton Windsor
Humber Bay
Sunnyside Beach
Exhibition Grounds
Western Channel
TORONTO HARBOR
Eastern Channel
Lake Ontario
Lake Ontario
LEGEND
Railways
Highways
Steep slopes
Recreational land
0 1 2 3 miles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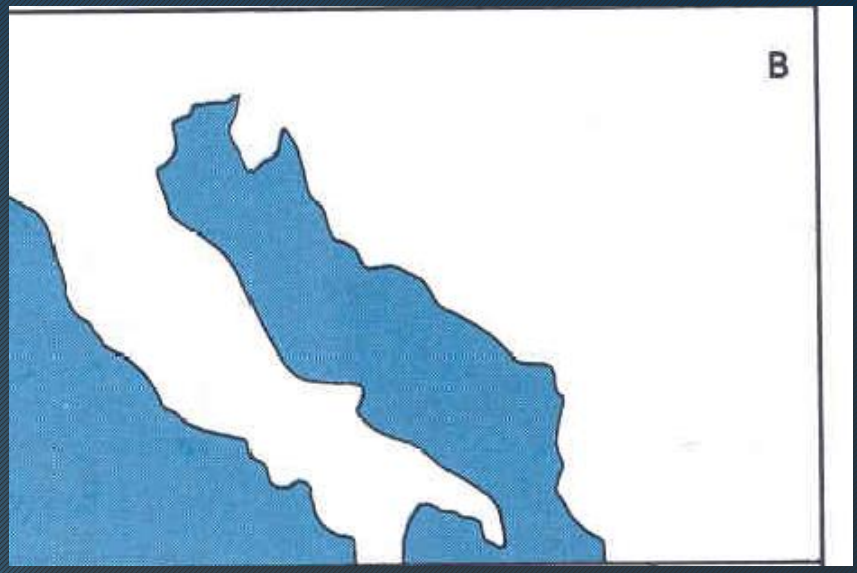
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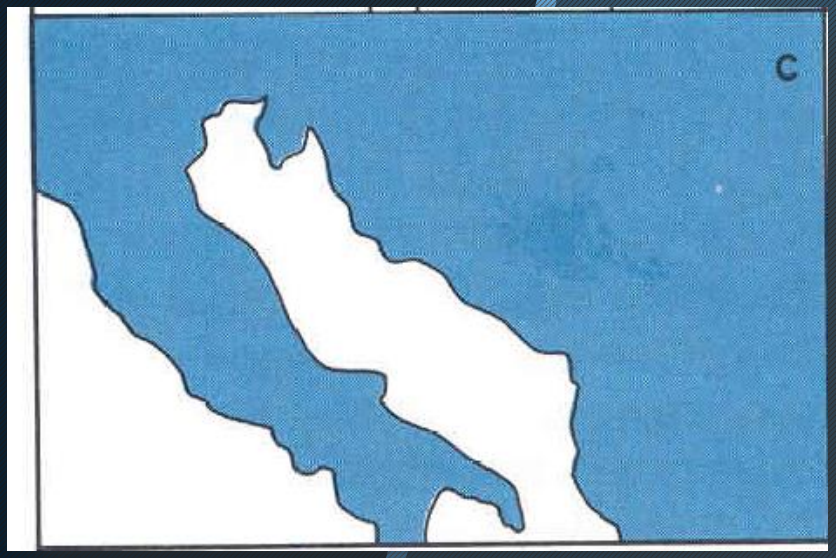
C


D
HUNGARY
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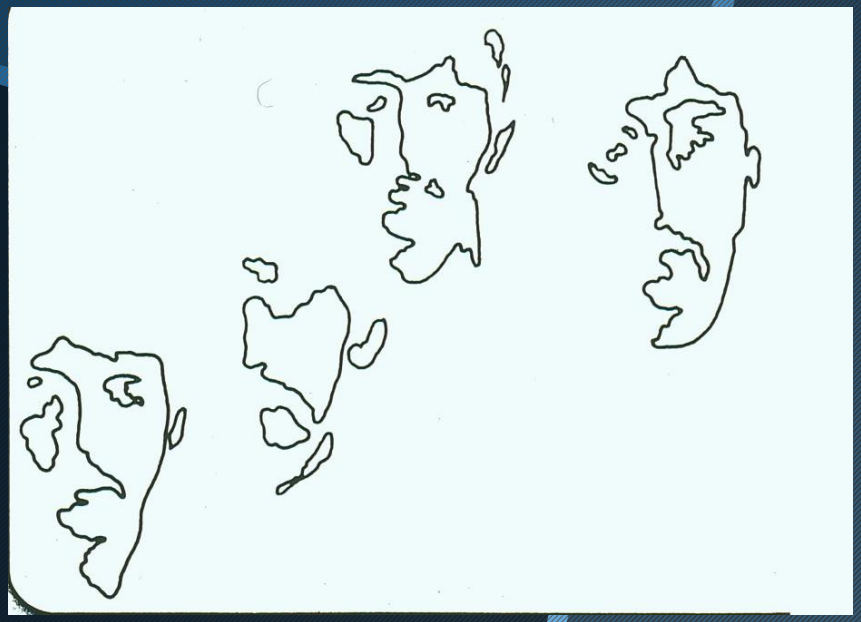
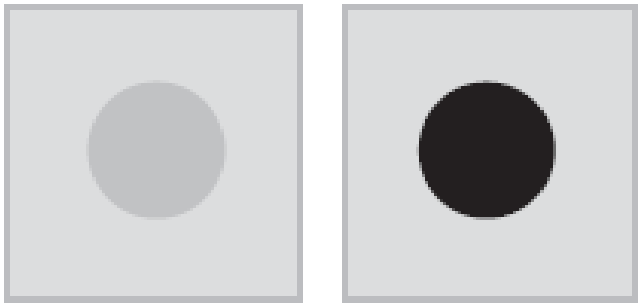
ITALY
ALBANIA
GREECE

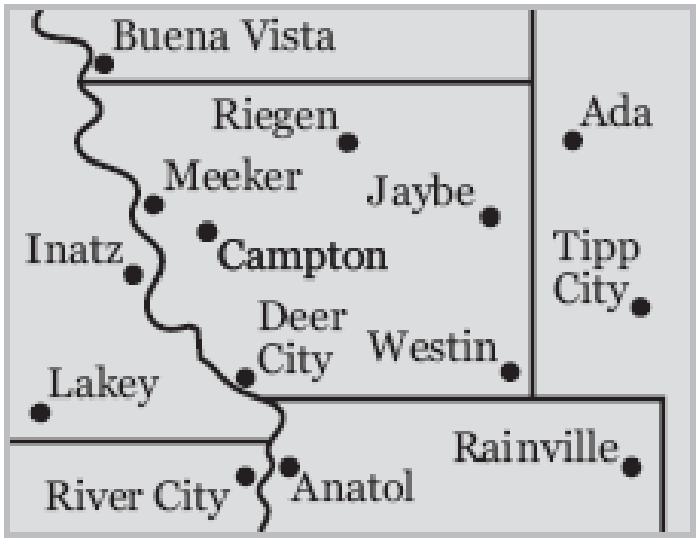


visual difference

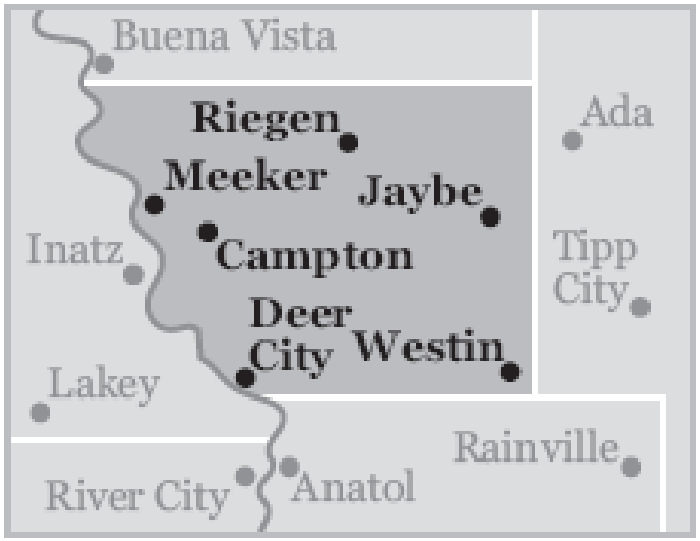


Noticeable visual differences separate figure from ground and enhance visual hierarchy. The examples on the following pages all enhance visual differences to build a visual hierarchy. To focus attention on the most important areas on your map, make it visually different from peripheral areas.

Poor visual difference:



Good visual difference:

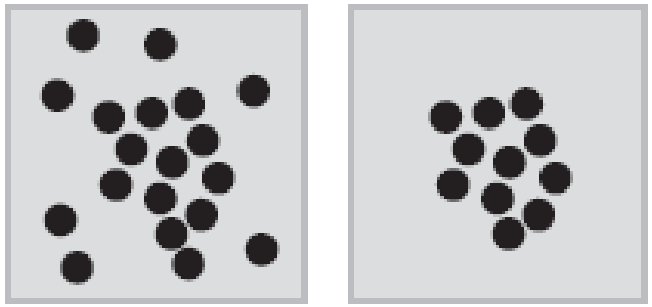


Visual Elements for Figure - Ground

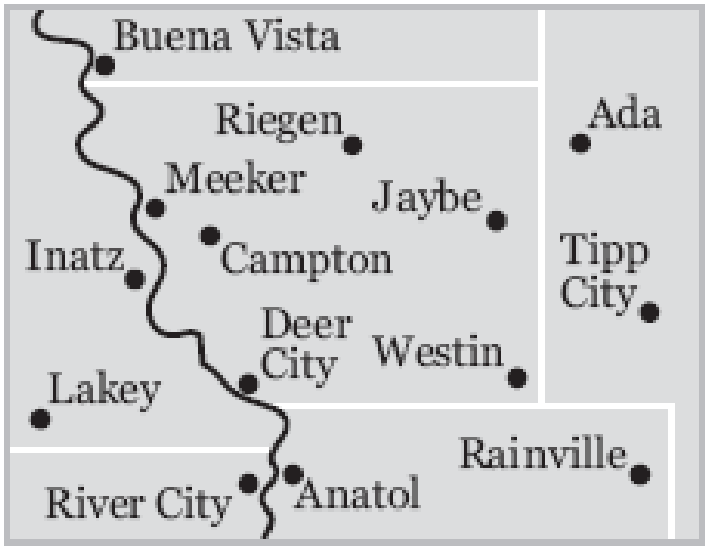
Detail (or Articulation): Figure has more detail than ground

detail

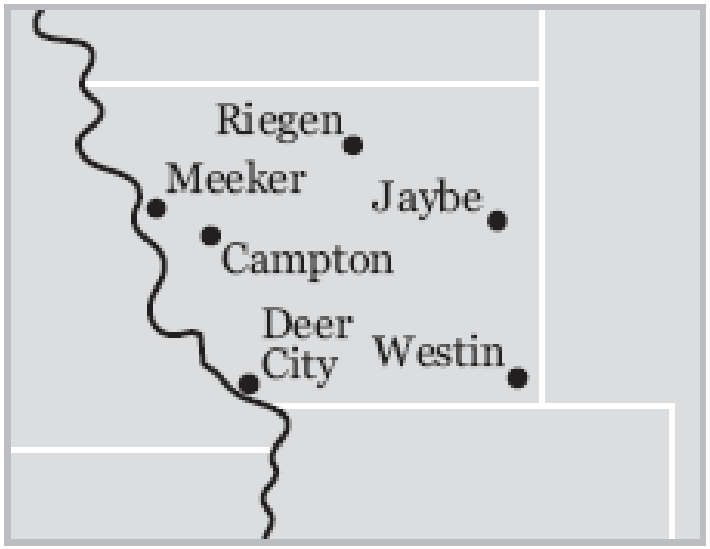
Figure has more detail than ground. To focus attention on the most important area on your map, reduce detail in peripheral areas.



Poor detail:

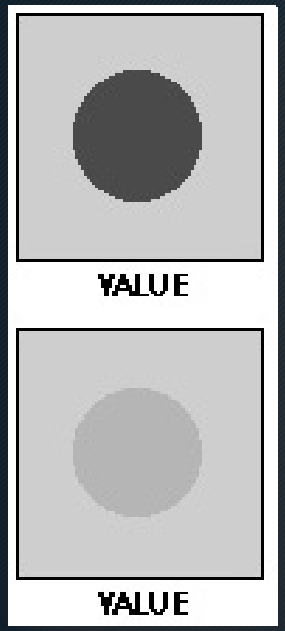


Good detail:



Visual Elements for Figure Ground

Value: Darker areas tend to be figure



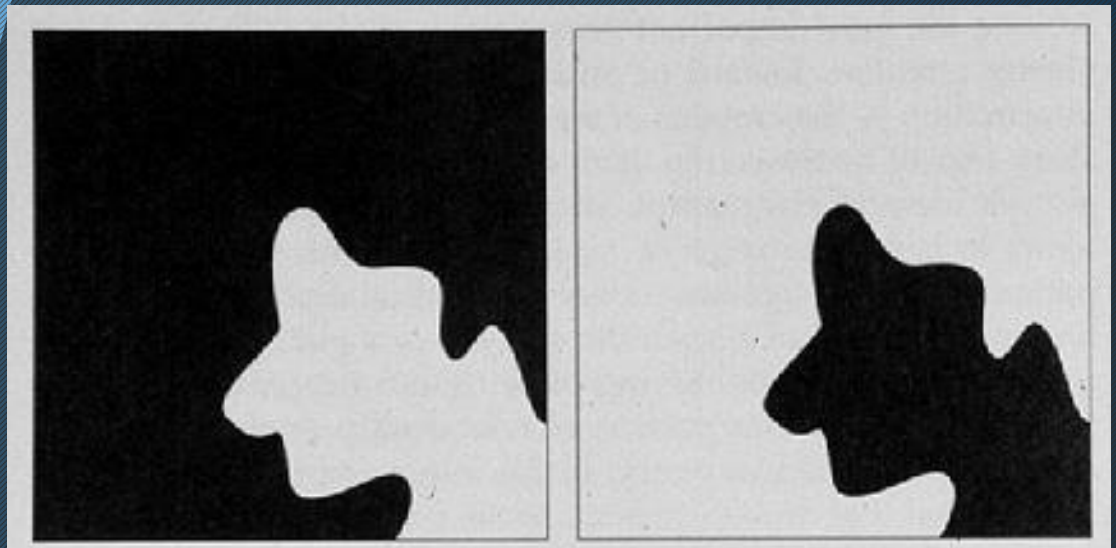


Figure 5.01 Value contrast is used here to visually differentiate two map regions (a chemical spill and a section of open sea). The difference in size between the chemical spill and the surrounding sea causes the spill area to appear as figure regardless of whether the shading is black spill-white sea or the reverse. Black oil is of course, the more mimetic choice.

Visual Elements for Figure - Ground

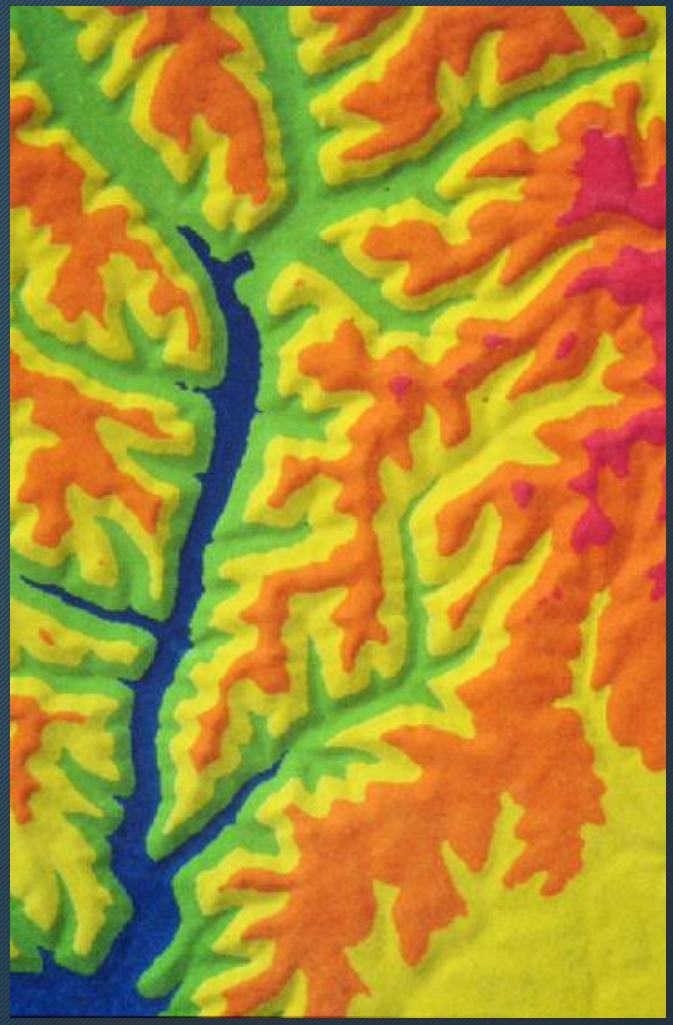
Color: Higher color intensities tend to be figure

Good Figure Ground

Poor Figure Ground

Good Figure Ground

Poor Figure Ground



Visual Elements for Figure - Ground

Color: Higher color intensities tend to be figure

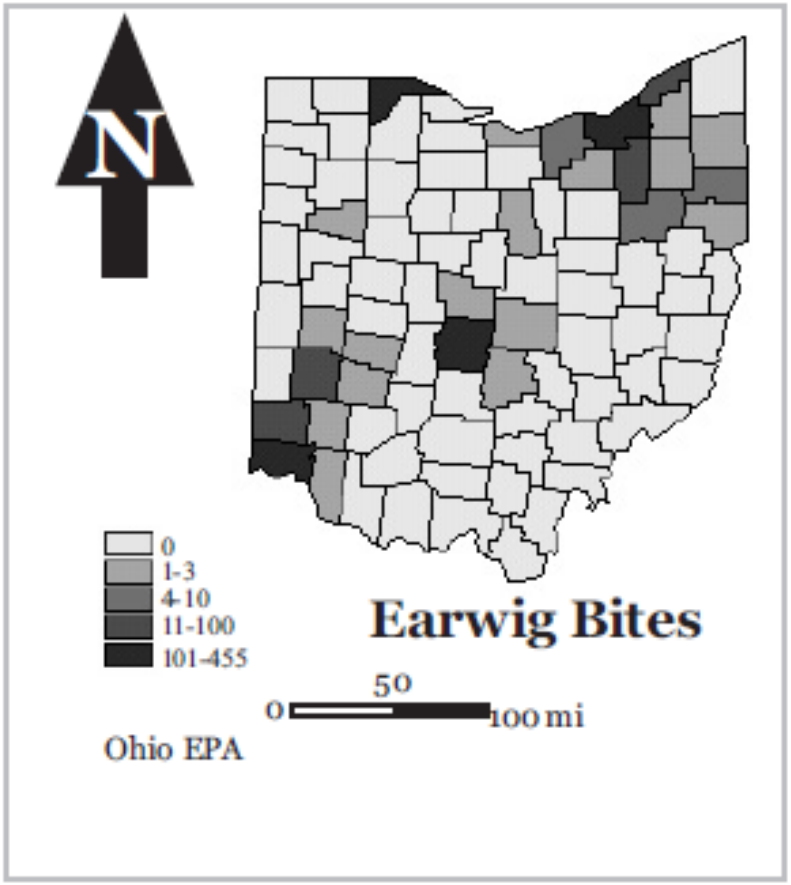
Overall Map Layout

- "When map layout *succeeds*, map readers *will not notice*: they will focus on the content of the map.

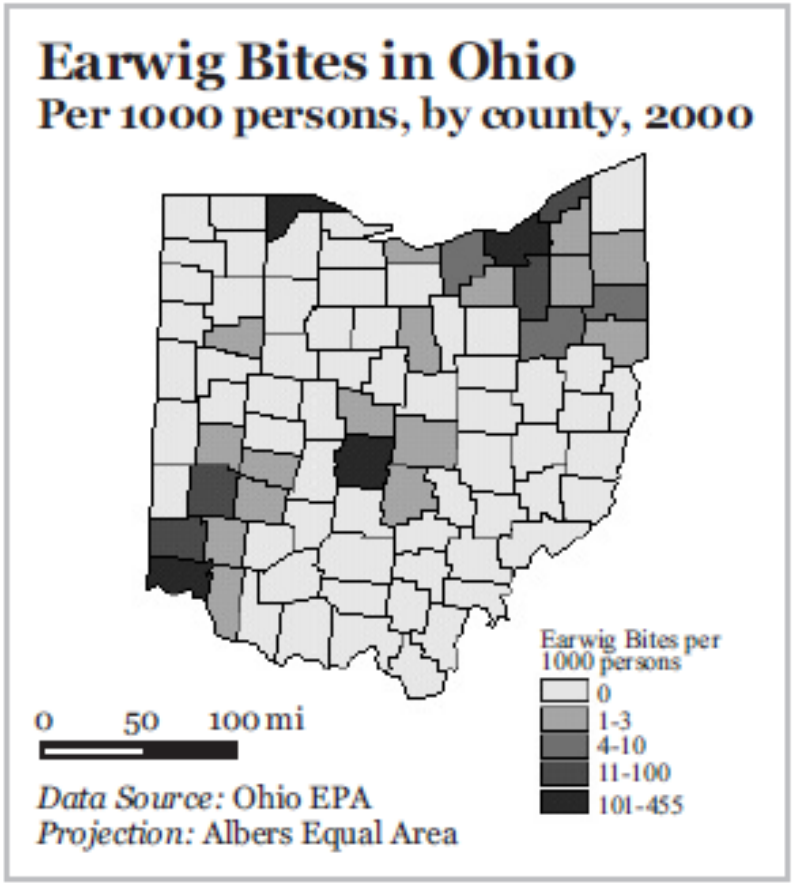
- "When map layout *fails*, the map reader *will notice*: an awkward layout distracts the map reader from the subject and goals of the map.

Overall Map Layout

Poor layout:

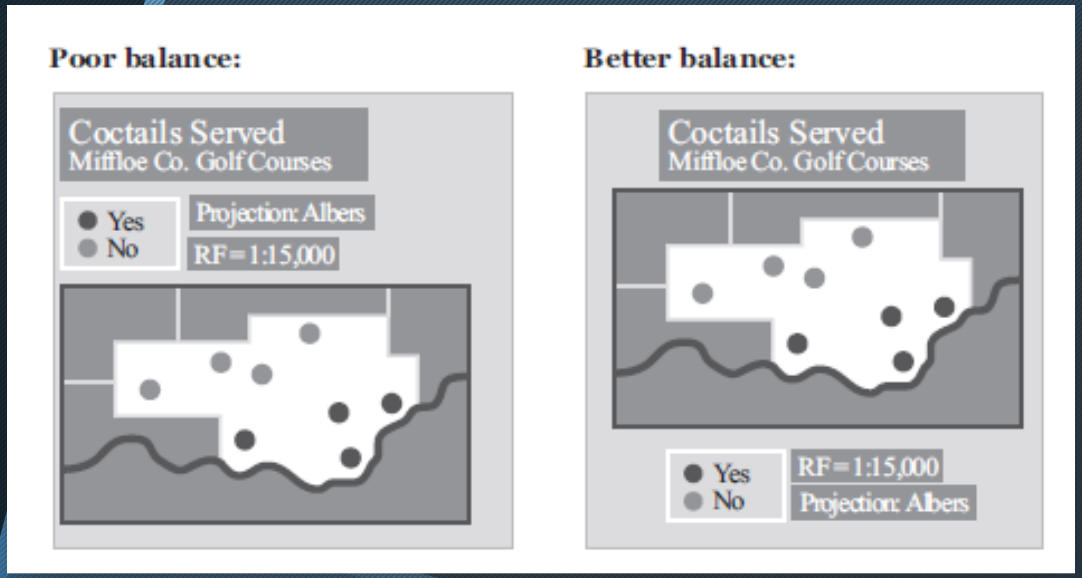


Good layout:



Map Layout

- Balance: the stability of a map layout
- Map elements vary in weight
  - Heavier elements include those that are larger, darker, brightly colored, simpler and more compact in shape, and closer to the map edge.
  - Lighter elements include those that are smaller, lighter, dully colored, complex or irregularly shaped, and closer to the map center.

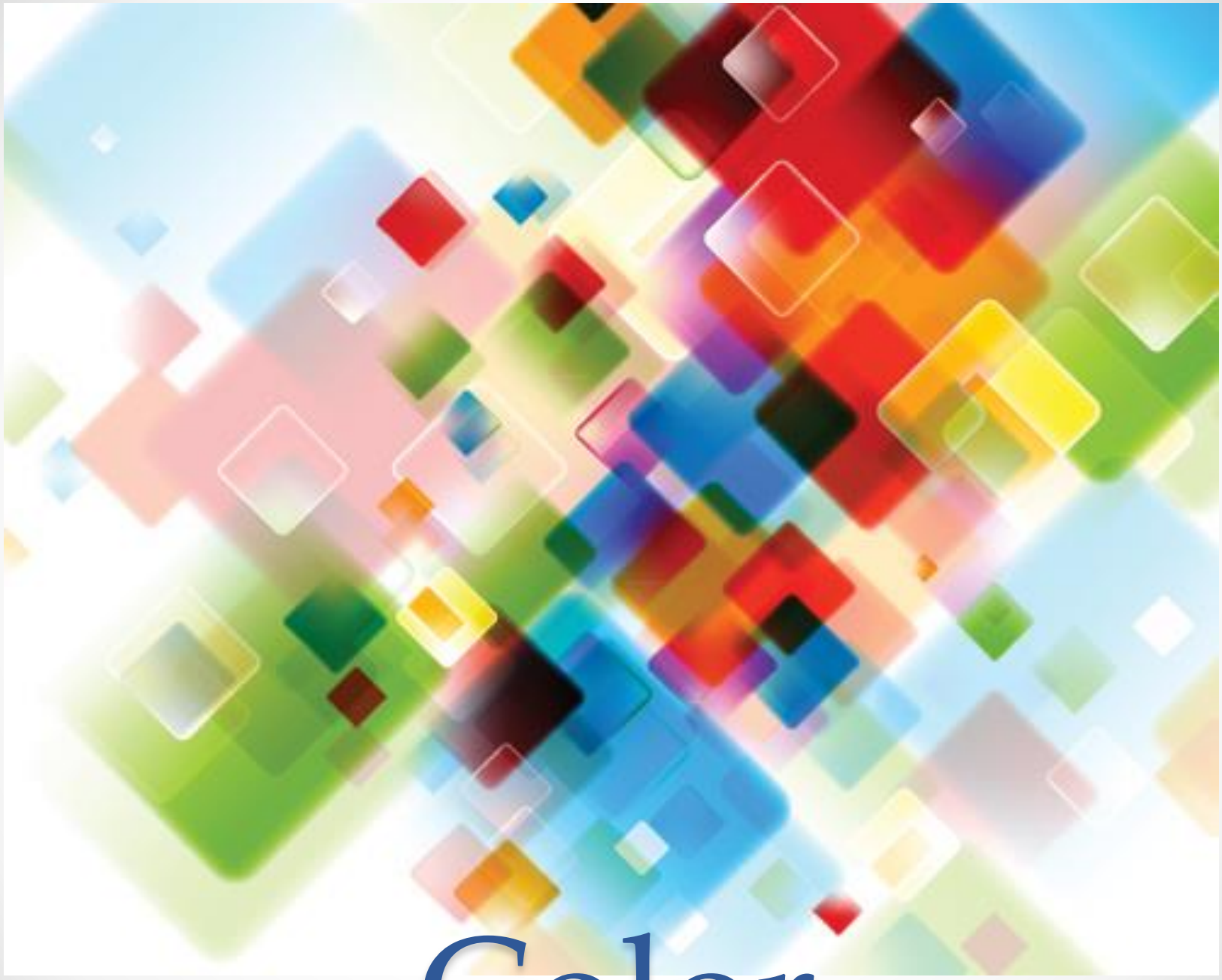


Legibility

- All aspects must be neatly drafted
- All symbols should be wisely selected to maximize differences among them and the background they appear on.
- Lettering is sufficiently clear and large enough to be viewed
- Line work is not so fine as to disappear or be hard to discern

White Space (Empty Space)

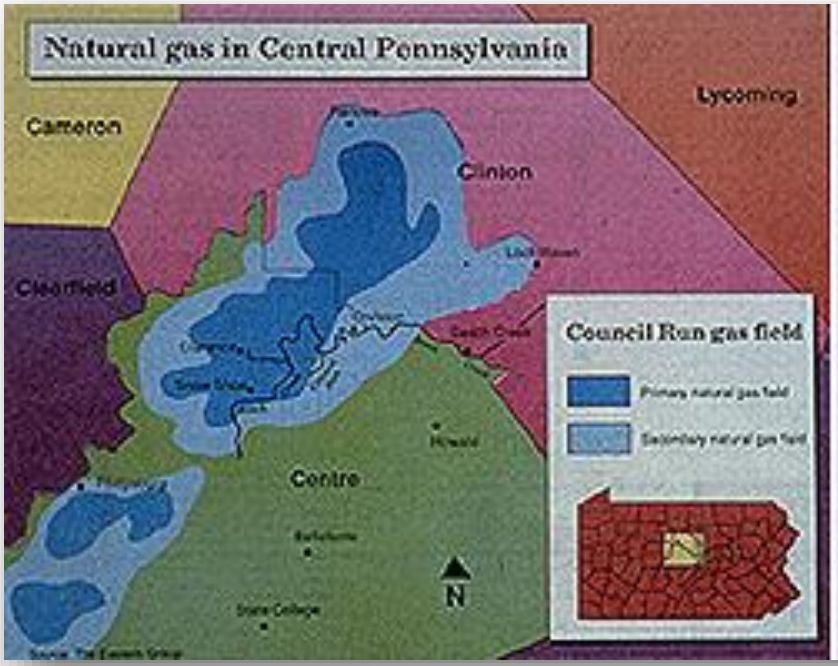
- White Space Conservation
  - All map features should fill the allotted space as nearly as possible.
  - Use the space, do not design map elements that waste a lot of space.

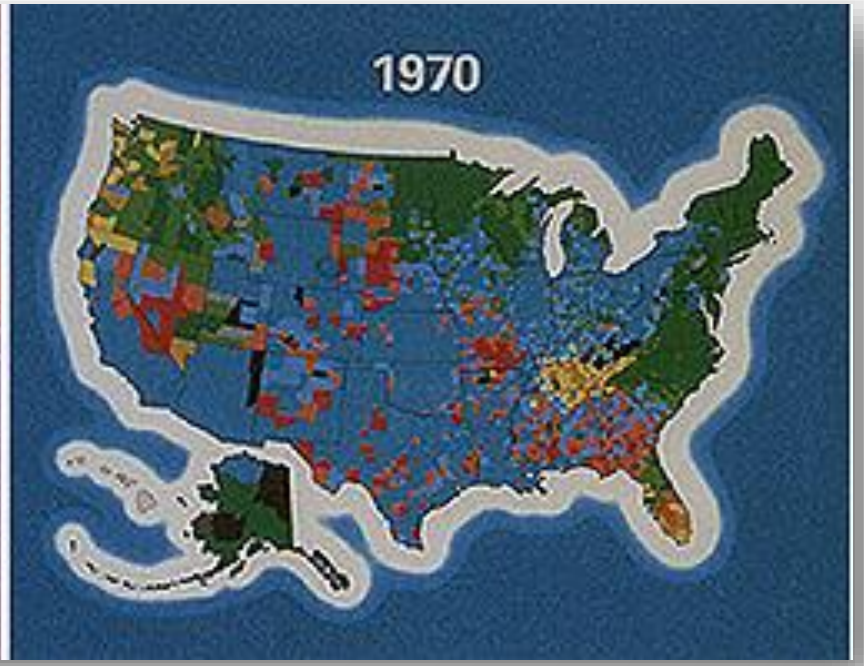


Color

Color in Cartography

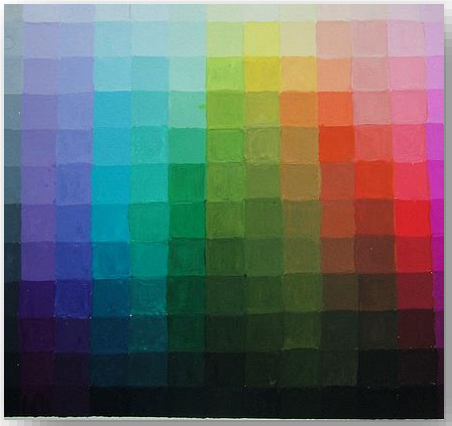
- Color is fundamentally important to cartography and fundamentally confusing





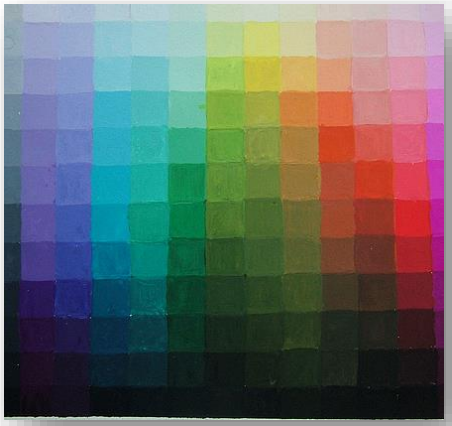
Color in Cartography

- Color is confusing and there are no specific standards
- Many different ways to specify colors
- Color is often misused with new technologies



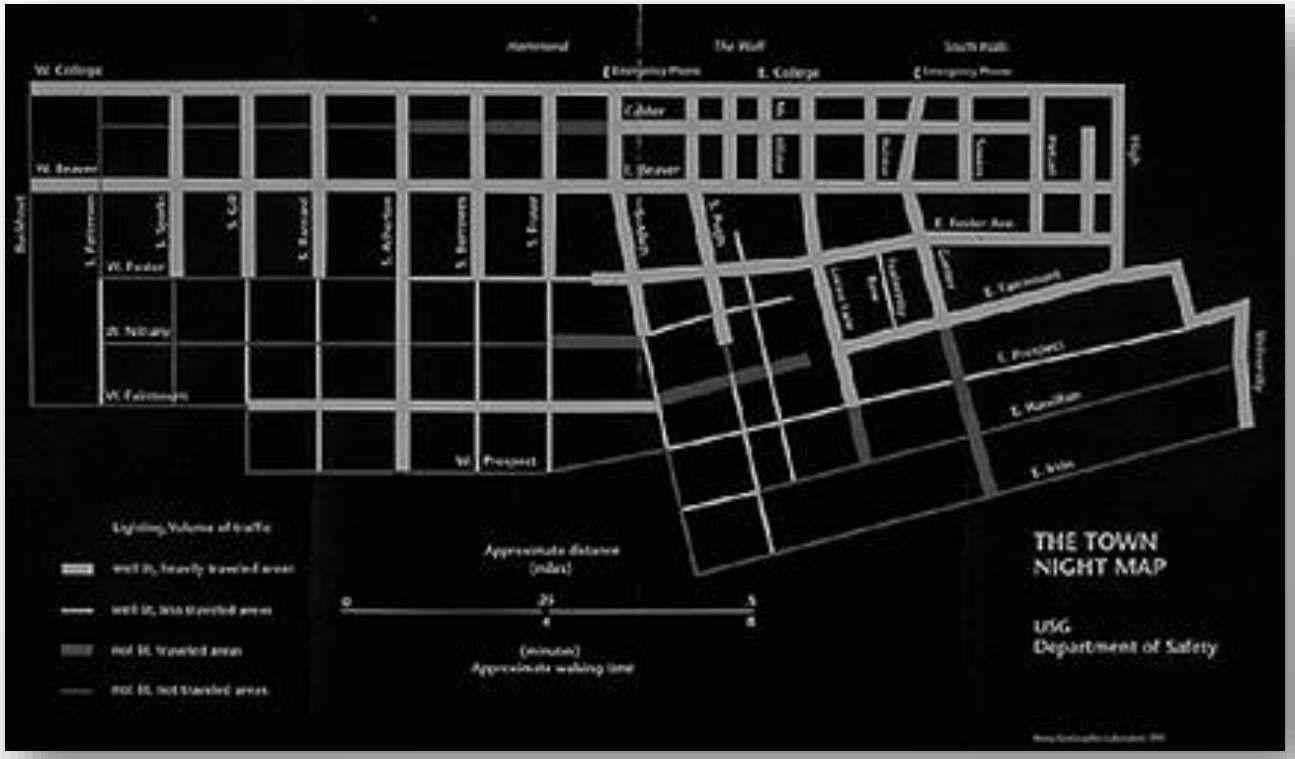
Color in Cartography

- One broad, general rule:
- Use VALUE for ranked data (numeric)
- Use HUE for nominal data (qualitative)



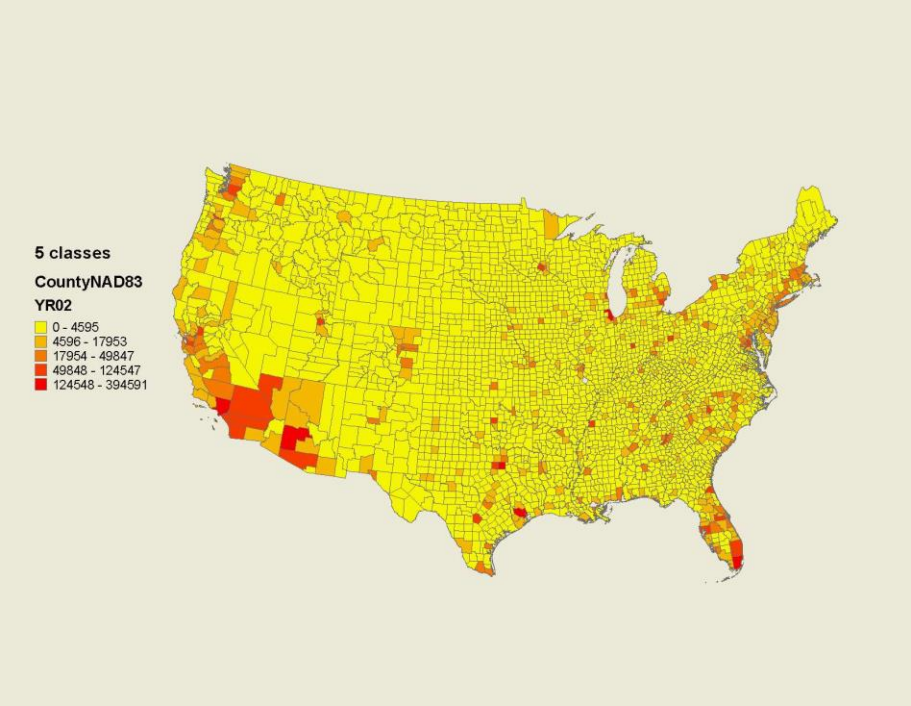
Color in Cartography

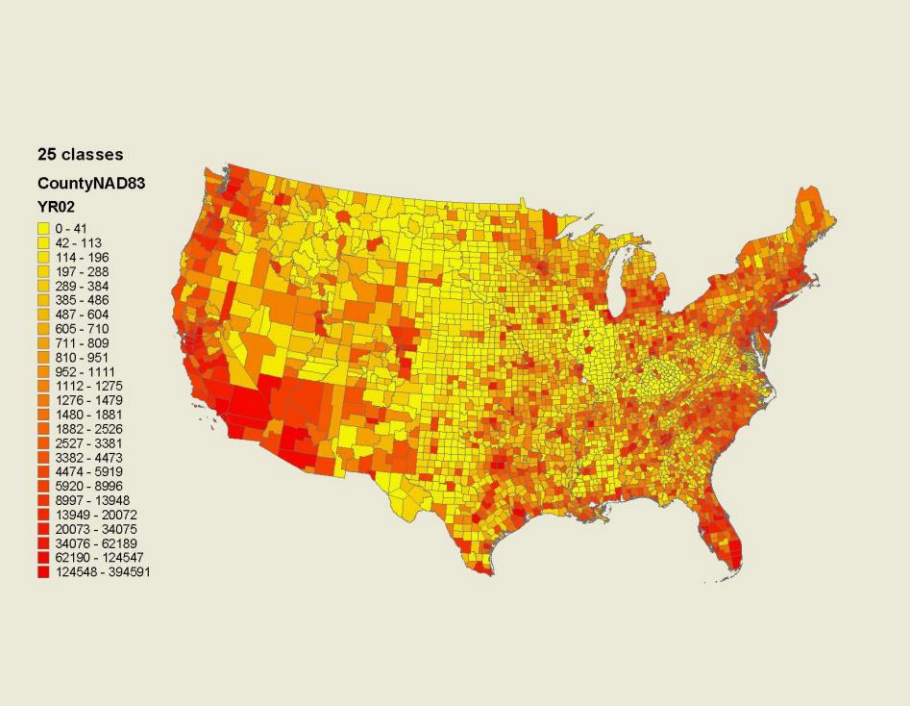
- There is a lot that you can do with black and white.



How do we see colors?

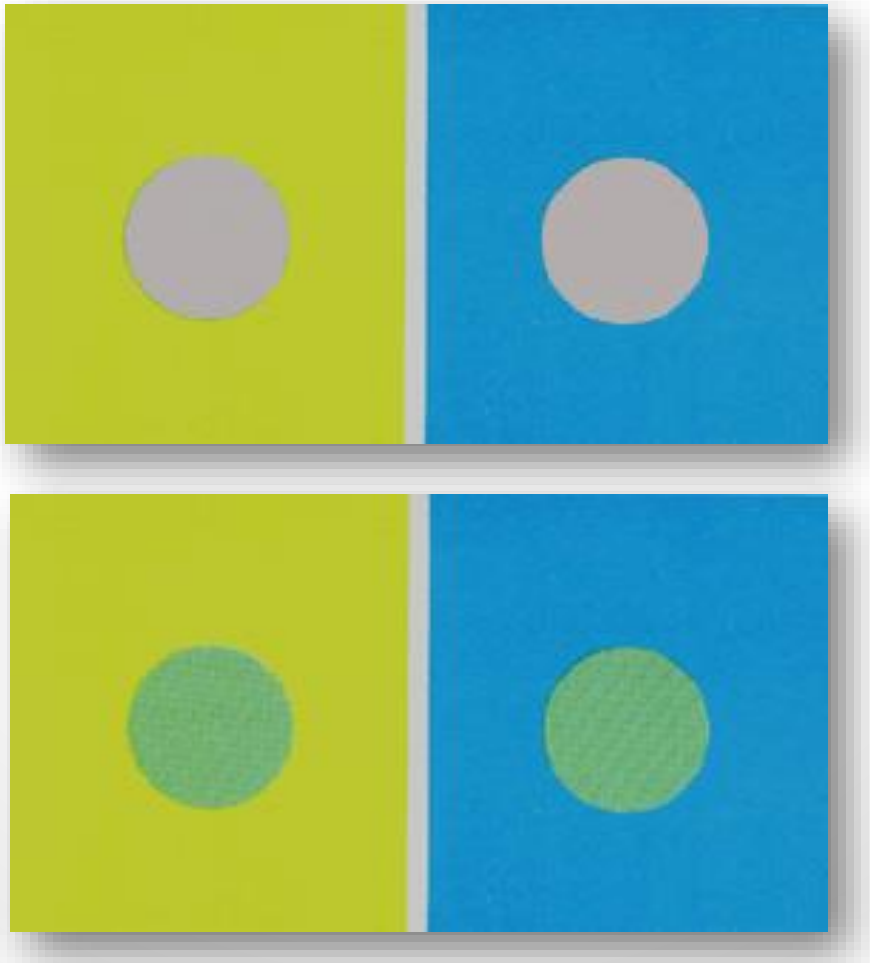
- **Sensitivity**:





Complexity of Color Use

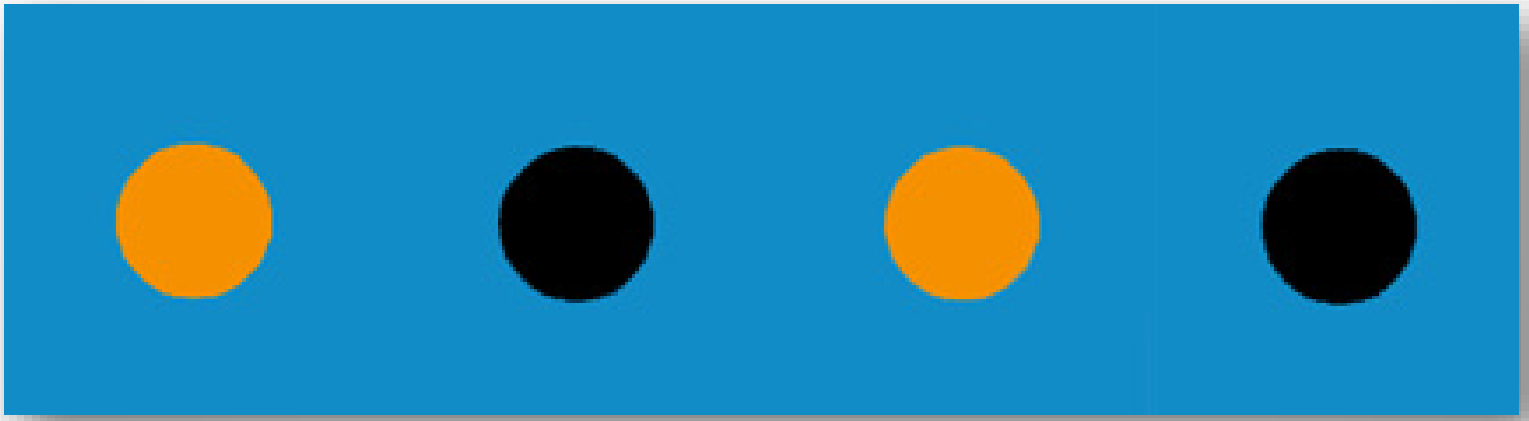
- **Color Interacts with its Environment**
- **Simultaneous Contrast**:

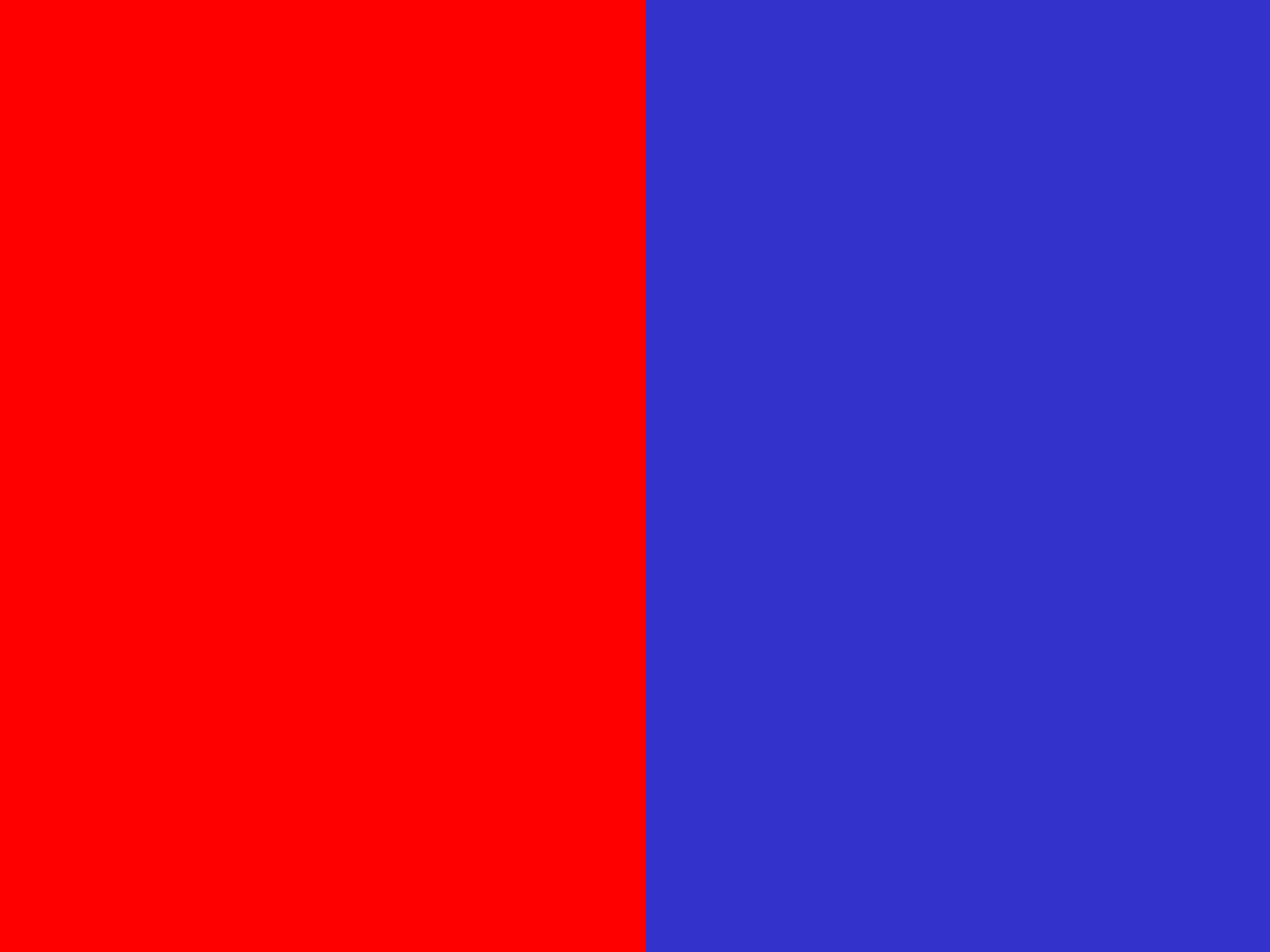


Complexity of Color Use

- Color Interacts with its Environment

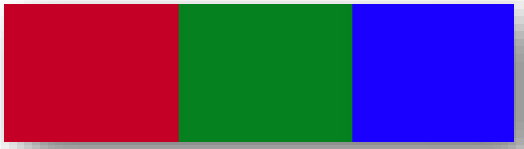
- Successive Contrast:

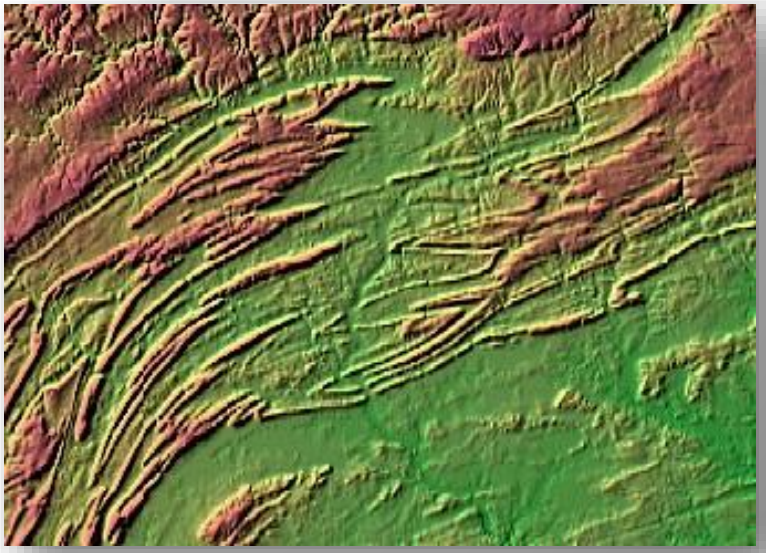




Complexity of Color Use

- Advance and retreat: perceptual phenomena whereby reds seem to advance (stand out more) and greens and blues seem to retreat (fall back more) in the visual plane
- Hypsometric tints



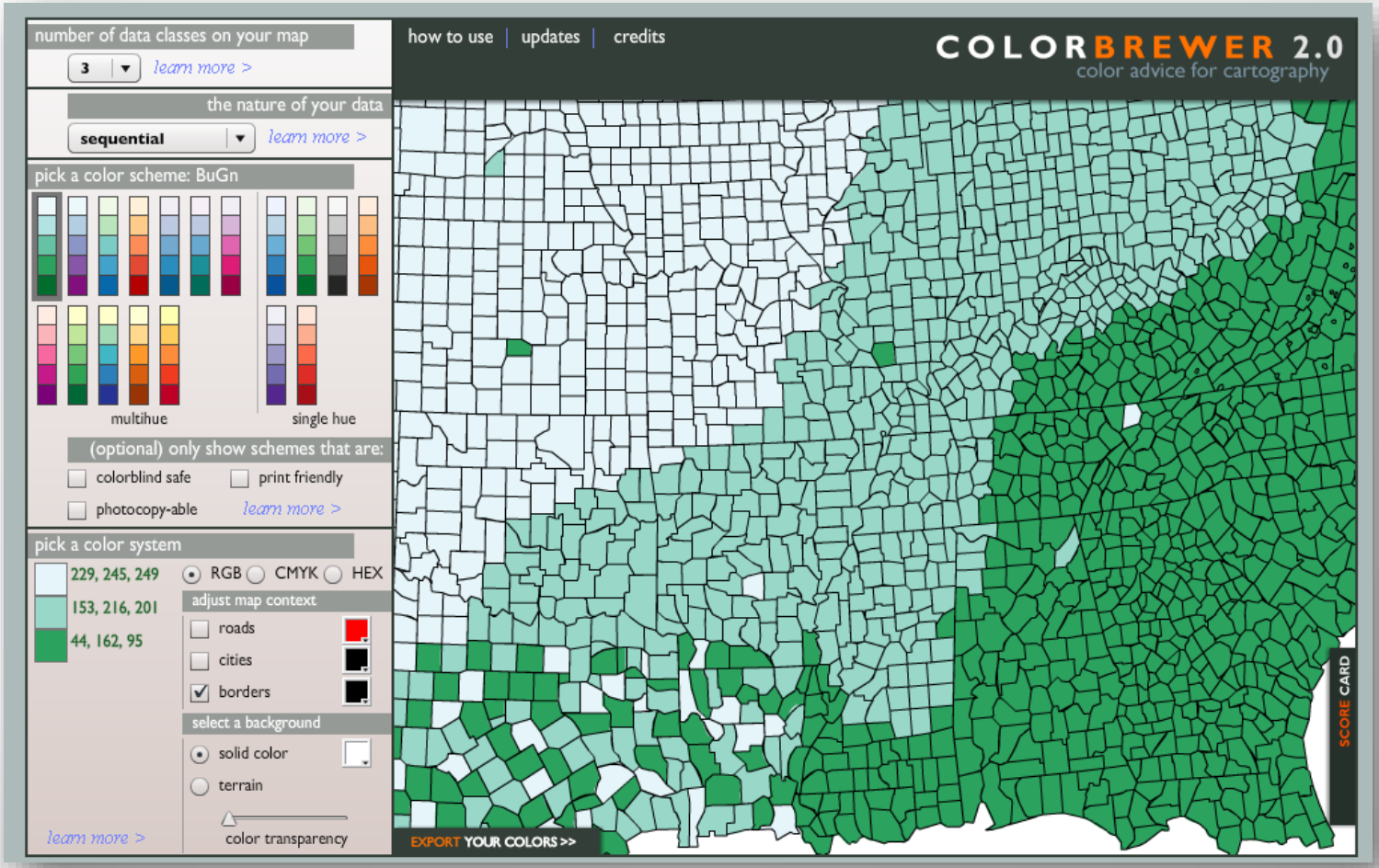


Complexity of Color Use

- Physiological Differences among Individuals
- Young children (< 5 years)
  - Seem to understand only a limited set of hues, and have difficulty arranging different color values in any kind of order
- Older people
  - Less sensitive to color and need brighter (saturated) colors
  - Older people lose the ability to perceive blue
- Color Blindness
  - in 3% of females and 8% of males (red and green look same)
  - Using colors that are colorblind safe

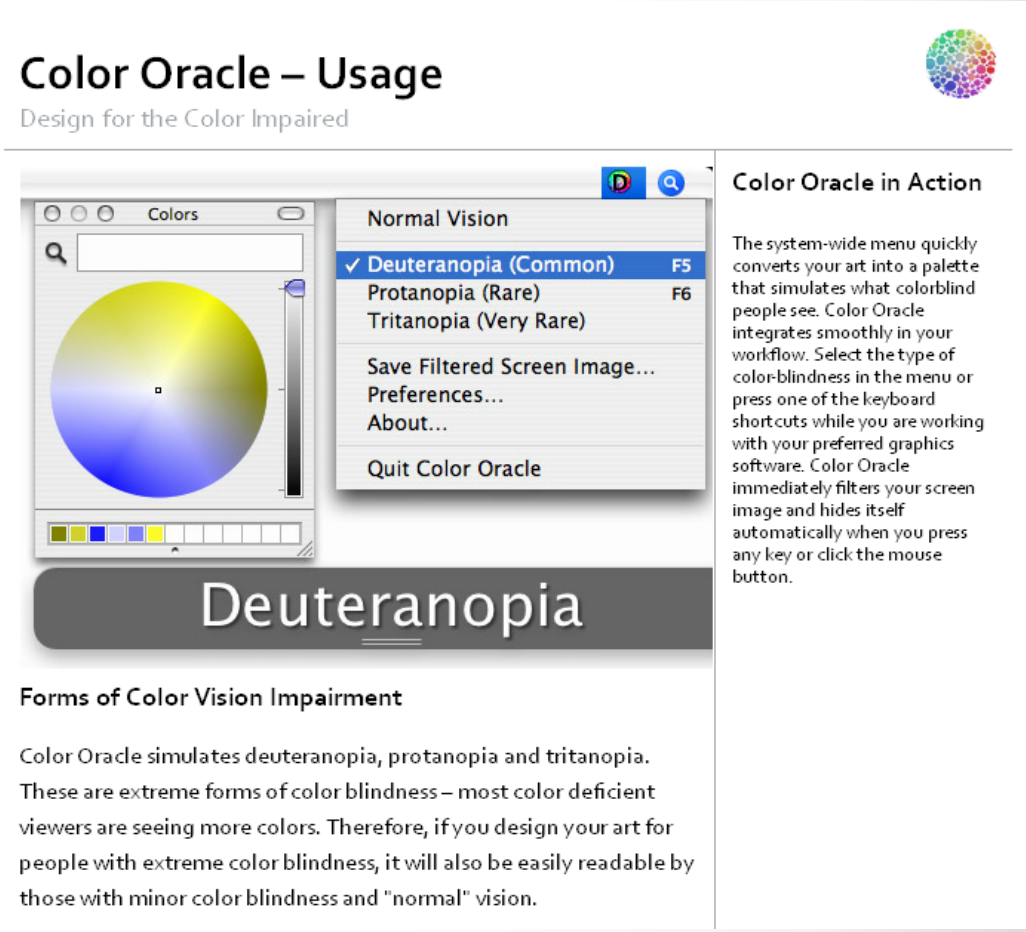
Color Resources

- Color Brewer: web-based tool for choosing appropriate color schemes
- http://colorbrewer2.org/



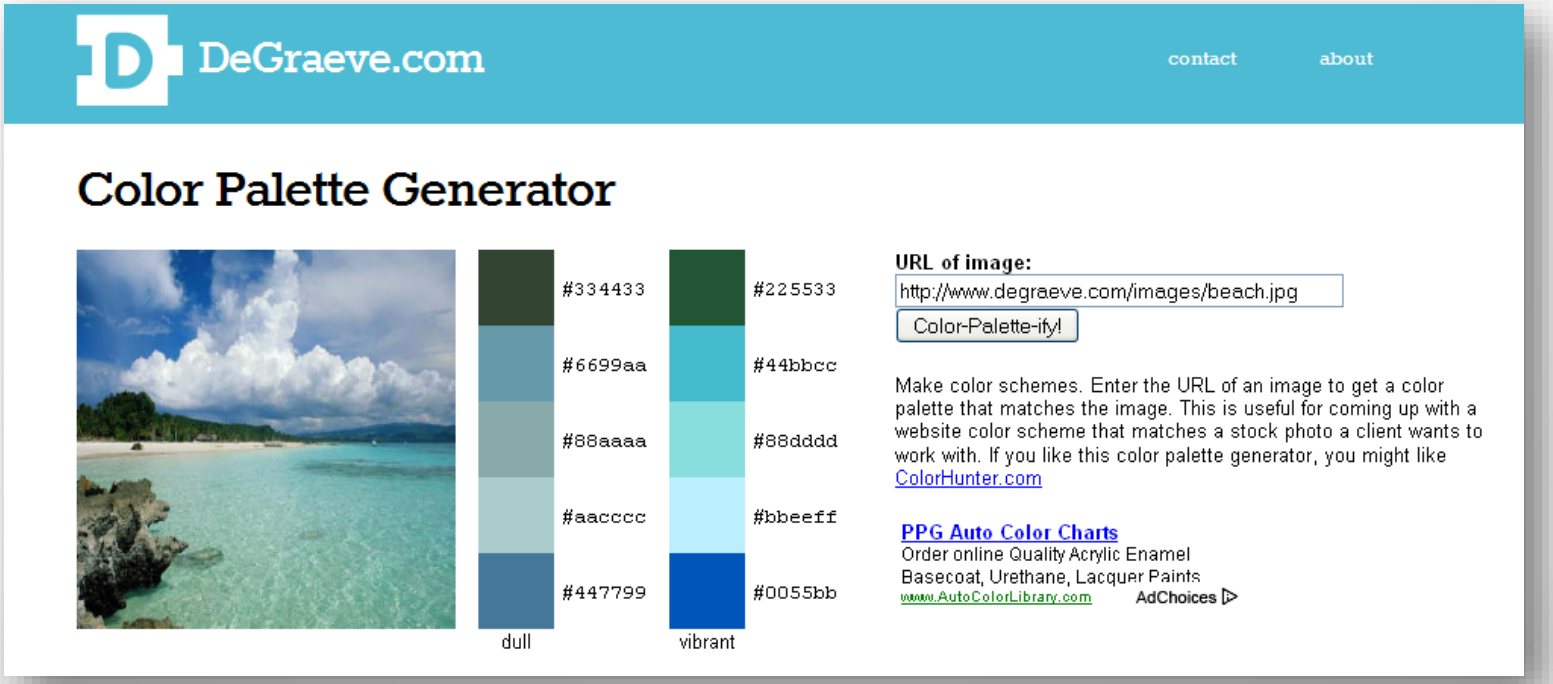
Color Resources

- Designing for Color Blindness
- Color Oracle: Free software that simulates three types of color blindness on your computer screen.
- http://colororacle.org/index.html



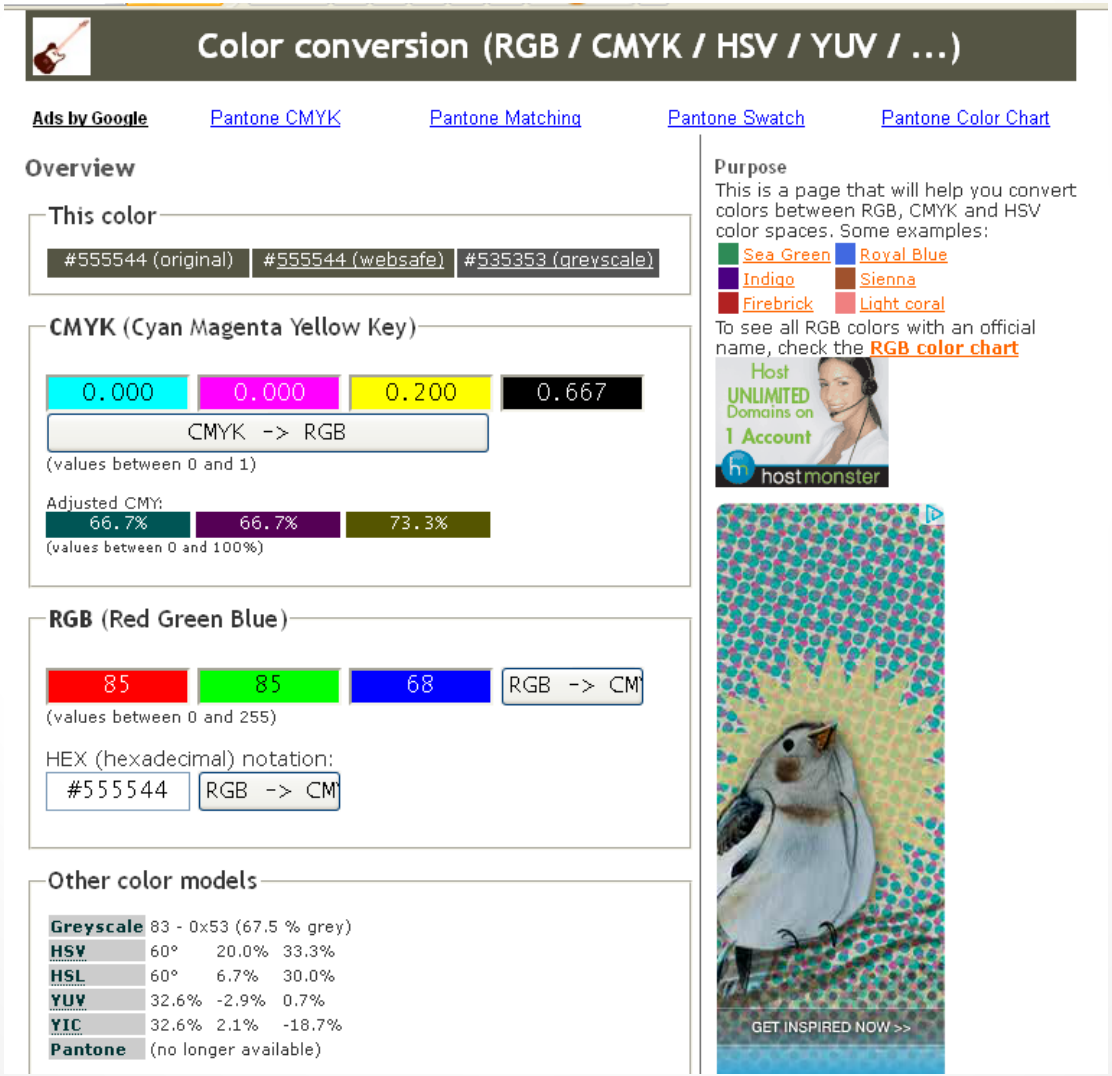
Color Resources

- Color Palette Generator
- Submit the URL of an existing image and generate colors that match the image
- http://www.degraeve.com/color-palette/?src=rss



Color Resources

- Color Conversion among different systems
- http://web.forret.com/tools/color.asp



Color Reminders

- Color is misused more than other visual variables.
- Variations and changes in color should mean something. Attempt to correlate variations in the data with logical variations in color.
- Avoid gratuitous use of color. Use color to contribute to understanding, not to add any confusion!